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# Crossing the Technology Valley of Death: The Case of the MDUSV

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Monterey, California. Naval Postgraduate School

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Acquisition Research Program:  
Creating Synergy for Informed Change

# Crossing the Technology Valley of Death: The Case of the MDUSV

(Medium Displacement Unmanned Surface Vessel)

David Ford  
Texas A&M University

John Dillard  
Naval Postgraduate School







# Uber Driverless Car Hits Pedestrian

**The New York Times**

**MARCH 18, 2018**



## Matériel Solution Analysis

## Technology Maturation/RR

## Engineering & Manufacturing Development

## Production & Deployment

## Operations & Support

- IDEA IS BORN
- DEFINE NEED
- ALTERNATIVES?
- GET FUNDING

- PROVE THE TECHNOLOGY

MODELING &  
SIMULATION

- GET READY FOR PRODUCTION

- PRODUCE IT
- FIELD IT

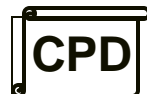
- SUPPORT IT
- IMPROVE IT

PROTOTYPING

EARLY USER  
TESTING

SUB/FULL SYSTEM  
TESTING

PRODUCTION  
DELIVERIES



LRIP

IOTE

FUE

IOC

FRP

FULL  
FIELDING

What can  
be skipped?

# The “Sea Hunter”

**Anti-Submarine Warfare Continuous Trail Unmanned Vessel**



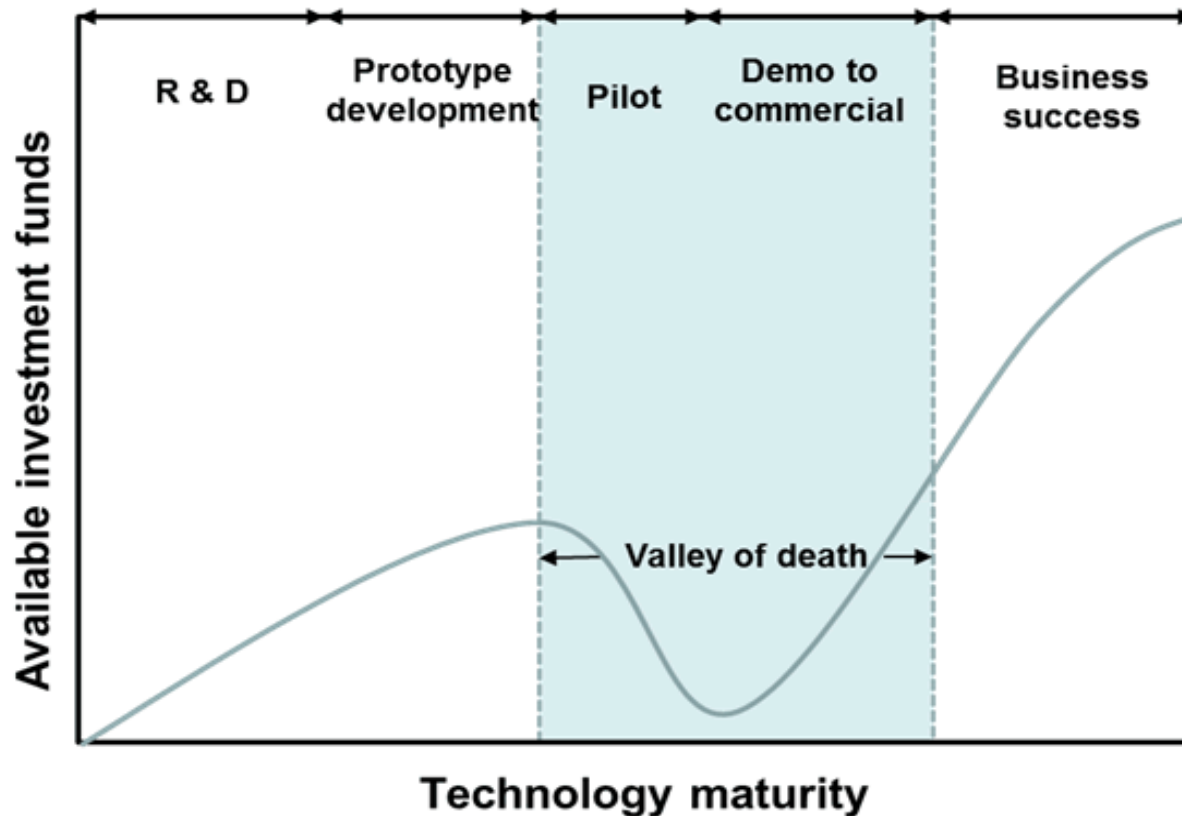


# ACTUV (MDSUV) Launched, 27 January 2016



# The Valley of Death

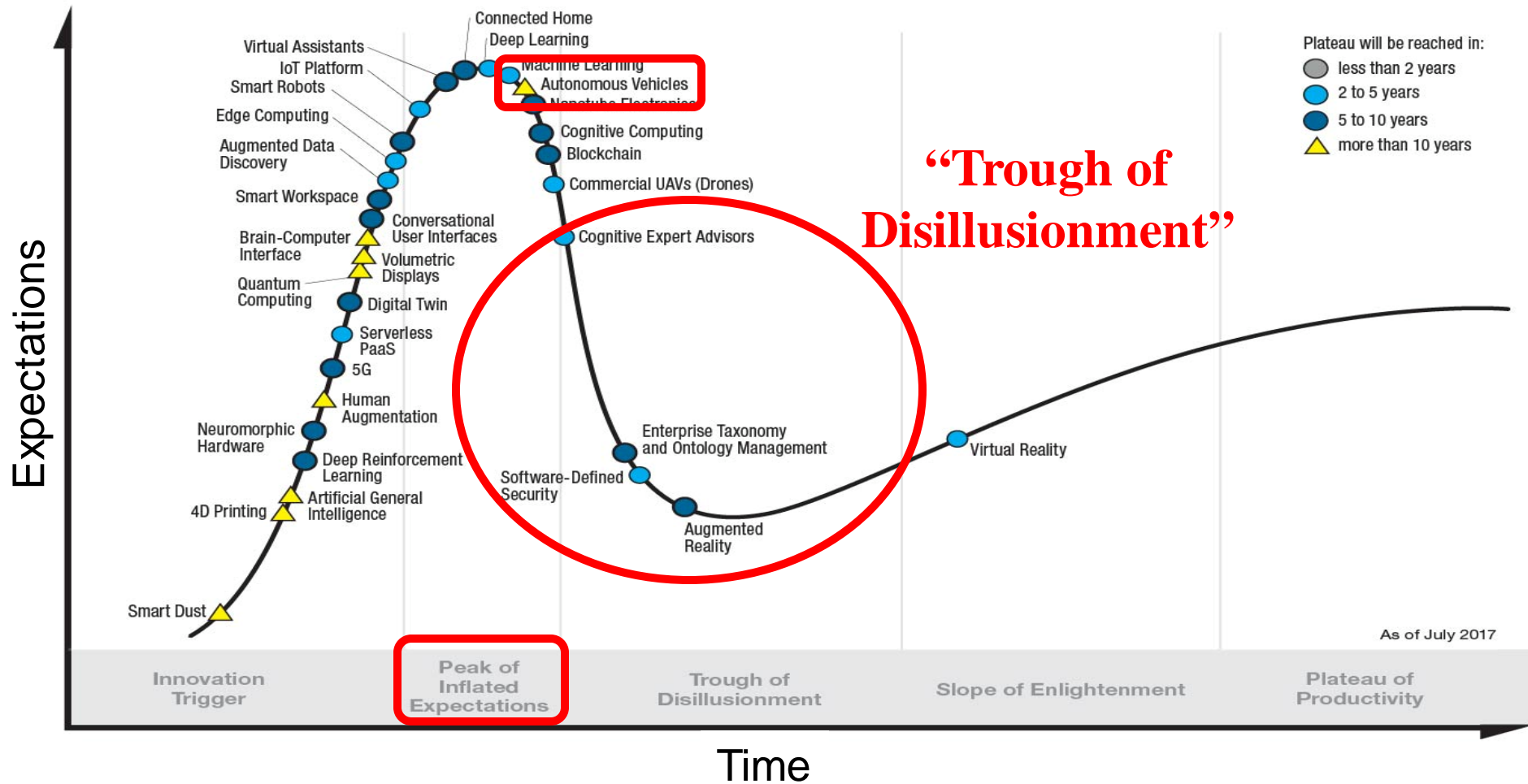
- Metaphor for getting from basic research to successful application





# The (Technology) Valley of Death

## Gartner **Hype Cycle** for Emerging Technologies, 2017



[gartner.com/SmarterWithGartner](https://gartner.com/SmarterWithGartner) (Panetta, 2017)



Acquisition Research Program: Creating Synergy for Informed Change

Naval Postgraduate School  
Monterey, CA

# Crossing the Valley of Death - Challenges (1 of 2)

- **Technology development**

- Is the right technology alternative selected?
- Will the technology meet requirements on schedule?
- Will it be manufacturable at scale, at rate, and at reasonable costs?
- Will the technology be upgrade-able to meet future needs?

- **Cultural barriers**

- Bias for preferred (existing) solution
- Organizational structures may not adequately support integrated development





# Crossing the Valley of Death - Challenges (2 of 2)

- **Knowledge management**
- **Technology use**
  - **Users not ready to accept** (in-line skates available in 1972 but Rollerblades only succeed 1987+)
  - **Integration of use into operations**
- **Regulatory constraints** (UAV pizza delivery)

**Q.:** How can the DoD assess and plan for crossing the Valley of Death?



# ***Crossing the Valley of Death:***

## **Behavior Modes** (Gulbrandsen, 2009)

- **Linear Behavior Mode**
  - A linear, objective, process-based approach
  - Sequence of phases
  - DoD 5000
- **Social Behavior Mode**
  - trans-disciplinary, team based, highly interactive
  - Negotiated, requires crossing social processes & linkages
  - Reconceptualize the solution? Change technologies?  
Change use of the solution?
  - *Can interrupt progress in the Linear Behavior Mode*
  - Integrated Product Teams (IPT)





# ***Crossing the Valley of Death:***

## **Methods Recommended for Industry**

- Passionately focus on user needs
- Provide a better mousetrap
- Develop in short, iterative processes & early and rapid prototyping
- Introduce innovation gradually to reduce resistance and accelerate adoption
- Be willing to take risks
- Use collaborative concurrent development
- Target underserved (early adopter) users who are less committed to legacy solutions

**Q.: Which of these do and can the DoD adopt?**



# ***Crossing the Valley of Death:***

## **Methods Recommended for DoD**

- **“Joint Transition Planning Process”**  
(Pusateri et.al., 2015)
  - Team acts like a temporary IPT for crossing
  - Supports (does not replace) linear mode
- **DoD be a “fast follower” of commercial technology development instead of a “first mover”** (Lewis, 2017)
  - Some internal expertise, track technologies, learn, build interoperability into DoD AI systems
  - *Unclear how “fast follower” approach helps maintain DoD competitive advantage over adversaries*





# ***Crossing the Valley of Death:*** **A Framework for Assessment and Planning**

## **Challenges of crossing the valley of death:**

- Technology development
- Application development
- Overcoming social resistance

## **Behavior modes for crossing the valley of death:**

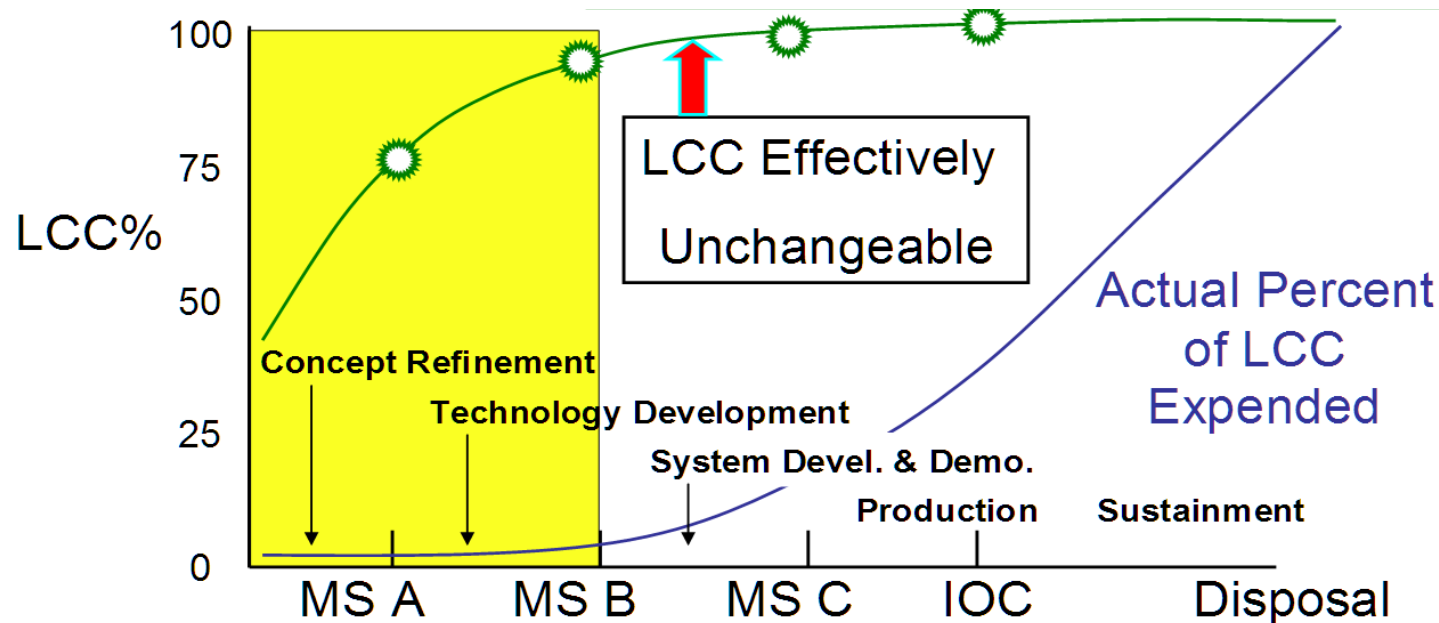
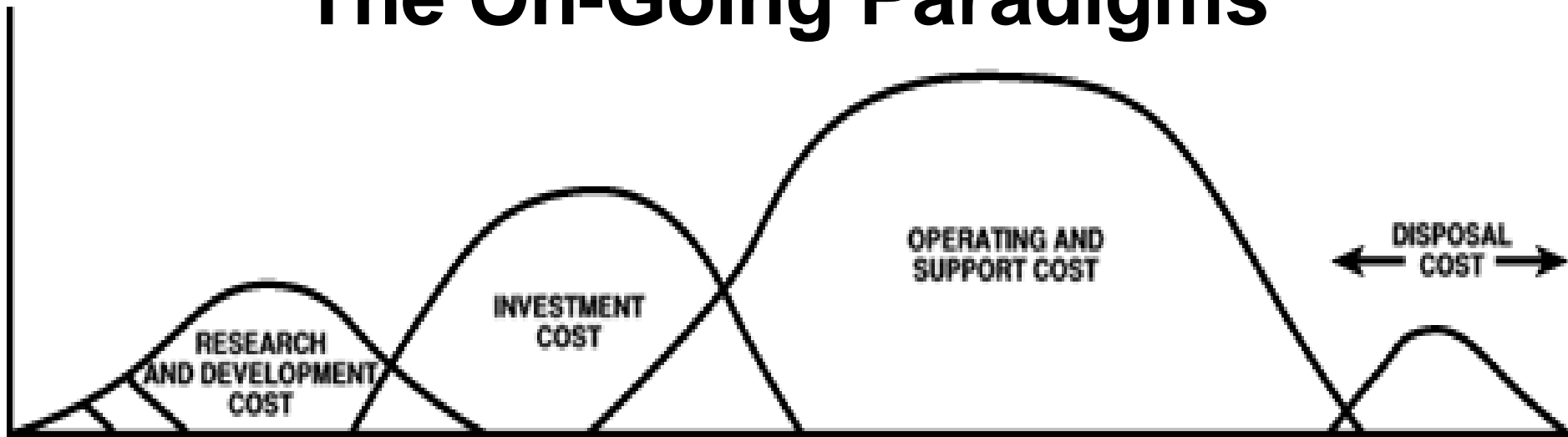
- The linear processes used
- The social processes used
- Interactions of linear and social processes in crossing the valley

## **Methods for crossing the valley of death:**

- Technology Development
- Application Development
- Overcoming Social Resistance



# The On-Going Paradigms



# **ACTUV (MDSUV) Workshop (14-15 Feb 17)**

## **Naval Postgraduate School, Monterey, CA**

### **6 BREAKOUT SESSIONS:**

- **C2**
- **Cyber Security**
- **EW**
- **ISR/SUW**
- **MIW/MCM**
- **Acquisition Strategy**

### **Acquisition Group Members:**

#### **Group Co-Leads:**

- NPS John Dillard
- N96 Earl Bowers

**PEO LCS PMO – PMA 406 Ed Sujecki**

**SPAWAR SD - Greg Kwik**

**LEIDOS - Gunnar Galsguard**

**NPS thesis student - Eric Ehn**

**N99 - Gary Herbert**

**DARPA - Todd Mack**

**DARPA - Chris Earl**

**DASN UxS - Andy Van Scyoc**

**Navy S&T - Jeff Butcher**





# **GOAL: TRANSITION MDSUV TO PROGRAM OF RECORD AND FLEET OPERATIONAL CAPABILITY**

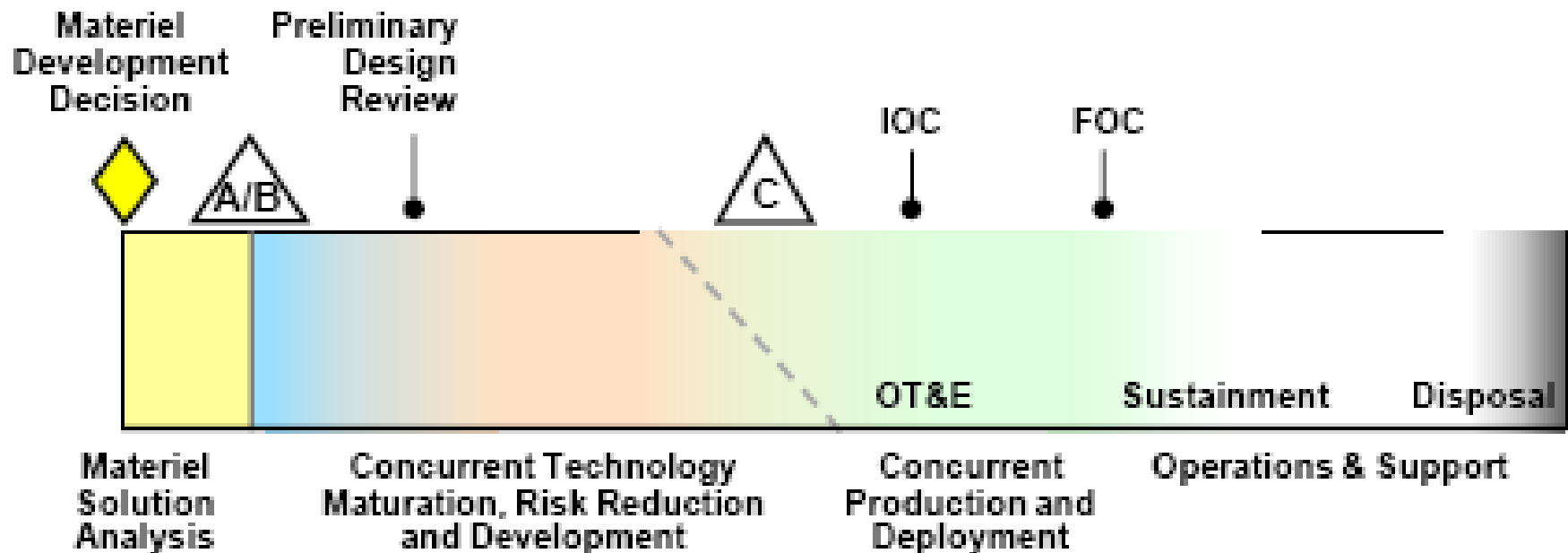
## **Things We Have Now:**

- An apparent value proposition of both capability and savings.
- Demonstrated technologies to > TRL 4-5.
- Initial configuration that has allowed for multi-mxn/payloads.
- Emerging missions of ASW, MCM, etc.
- Owners in the house: ONR > PEO LCS; Resource Sponsor: N96
- Funding thru end of Execution Year (FY18), with more planned.
- User interest and support to bring into the mixed fleet.
- A shared realization that a quantity of smarter and cheaper systems help offset the closing technological gap from near-peer threats.



# “Accelerated Acquisition Programs” Under DoDI 5000.02

- Schedule considerations can override cost and technical risk
- Compresses/eliminates phases to achieve a deployed capability sooner



# Acquisition Agility Guidance



THE ASSISTANT SECRETARY OF THE NAVY  
(RESEARCH, DEVELOPMENT AND ACQUISITION)  
WASHINGTON, DC 20350-1000

APR 24 2018

## MEMORANDUM FOR DISTRIBUTION

SUBJECT: Middle Tier Acquisition and Acquisition Agility Guidance

Reference: (a) Fiscal Year 2016 National Defense Authorization Act (Public Law 114-92)  
(b) Fiscal Year 2017 National Defense Authorization Act (Public Law 114-328)  
(c) USD (AT&L) Memo- "Middle Tier of Acquisition (Rapid Prototyping/ Rapid Fielding) Interim Authority and Guidance"  
(d) ASN (RD&A) Memo, "Designation of the Deputy Assistant Secretary of the Navy for Research, Development, Test and Evaluation to Lead Implementation of Accelerated Acquisition", dtd Nov 8, 2017

I hereby direct that the Middle Tier Acquisition and Acquisition Agility authorities provided under references (a) through (d) will be implemented within the Department of the Navy (DON) consistent with the attached Middle Tier Acquisition Interim Guidance and Acquisition Agility Interim Guidance.



# **CONCLUSIONS: THINGS STILL NEEDED**

**MDD and Family of Vessels Road Map & documented needs:**

- For a completely configured system with a specific feature set.**
- Tactics/behaviors fully understood in descriptive terms.**
- Missions and CONOPS defined.**
- Quantity of initial and follow-on buys for FOC.**
- Interoperability with other systems, platforms (COLREGS).**

**Time in development & test to reach acceptable TRL.**

**Revision of test grading paradigms for unmanned systems.**

**Funding in POM/FYDP > FY18 to avoid hiatus/loss of momentum:**

- LCCE for POM - 5 year look thru FY23**

**PMO designation to construct the Acquisition Strategy when operational and technical needs are further defined**

**Contract vehicle for continued govt/industry development efforts**

- identification of needed scope of work (cyber, comms, etc.)**
- Allow for competition and other players**



# RECOMMENDATIONS (1 of 4)

Recommendations for Sea Hunter and its emergent Program of Record, during experimentation and testing under the auspices of ONR, before the hand-off to PMA 406 are:

- Leverage the current regulatory (and industry) environment – Dynamic and permissive for prudent risk-taking.
- Requirements Capture and Refinement – better informed from experimentation efforts, evolutionary growth of capabilities identified for technology enablers not yet fully mature, especially those for range (versus binary) attainment of performance.
- *Sea Hunter* now afloat = multiple capability payload packages for various missions and CONOPS.
- Prototyping & sea trials now in parallel with JCIDS for Initial Capability Development documentation/validation constitute large steps in tech transition across the “Valley of Death.”



# RECOMMENDATIONS (2 of 4)

**Tailored Acquisition Strategy** – Leveraging of the DARPA project results, along with ONR's experimentation and sea trials should alleviate the necessity for a Technology Maturation and Risk Reduction Phase in the traditional model of acquisition.

**Streamlined Test and Evaluation** – As with contracting instruments, a balance must be struck among elements of good prudence and due diligence versus testing to the point of unnecessary extremes.

**Investment Decision Authority** – Lowest level Milestone Decision Authority is another recent legislative change that can speed the attainment of autonomous surface vessel capability.

**Abbreviated Documentation** – Along with a lowered threshold for decision-making, the dozens of bureaucratic documents traditionally required for milestone review should be consolidated and abbreviated.





# RECOMMENDATIONS (3 of 4)

**Simplified Contracting** – Recent legislation allows Other Transaction Authority (OTA) in lieu of Federal Acquisition Regulation contracting instruments from prototyping through production phases of acquisition. However, care must be taken for prudence: legal compliance regarding competition, rewards and incentives structuring, scope of work specification, performance measurement, etc. to avoid pitfalls already being seen in acquisitions attempting to exploit this method of shortening transaction timelines. Cautions also in areas of proprietary hardware and software from selected industry partners. Modular Open Systems Architecture should be emphasized in both business as well as technological functions. (<https://www.washingtonpost.com/news/the-switch/wp/2018/03/05/faced-with-increased-criticism-pentagon-slashes-cloud-computing-contract-awarded-to-an-amazon-partner/>)



# RECOMMENDATIONS (4 of 4)

**Maximize Modeling and Simulation** - For early requirements capture & product realization from Force-on-Force simulations to computerized design and platform integration.

**Disciplined Systems Engineering** – Seldom are shortcuts with regard to the necessarily disciplined engineering efforts at system and sub-system level. Systems Engineering processes have proven their value: issue discovery, risk management, configuration control and tech performance measurement on the iterative development path attacking complexity and uncertainty.

**Social Model Implementation** – Notwithstanding the necessary adherence to linear processes inherent in the DoD acquisition management structure, it will be the communication and coordination among stakeholders that will insure safe passage across the “Valley of Death.”



# Questions?

